

## Section 6 - DATA ANALYSIS and DISTRIBUTION

It is of paramount importance that the customer/user receive the data needed in the correct form specified and in a timely manner. Data sources may include mount operator logs, environmental measurements, mission predictions, astrometric measurements, time-tagged raw and calibrated digital and video data from MSSS and user-supplied sensors, and laser transmitter parameters when appropriate. Depending on the user's needs, this collected data may be prepared for delivery in several different package formats. Three tasks are usually involved in the preparation of data for a specified or requested data package: assembly of the components of data, data archiving, and special processing of the data.

### Data Treatment

In post mission, all photometric, radiometric, and video (image) data components and supporting information is collected and archived. The first step in data analysis is generation of a mission profile. This may include reviewing video tapes of AATS, MATS, or other imagery, to locate data segments (matching IRIG time codes to events imaged), ensuring that the data and supporting calibrations are properly annotated (filter in use, which FOV, etc.), surveying GEMINI imagery (keyed to the events of interest by time), and compiling accompanying computer-generated reports and other mission operations reports.

The process of archiving consists of identifying storage areas and maintaining logs for accumulated data. Appropriate data receives special treatment. The data is logged and controlled, utilizing document control procedures as outlined in the Industrial Security Manual (ISM); IR and photometric signature data is logged and maintained as unclassified material.

Further processing, performed at the Kihei offices, consists of data fusion, data interpretation, and other special functions to provide the data user with his requirements. For example, to obtain a data package which includes AMTA signature data, in addition to the data, Jones (black body) calibrations are processed for detector responsivity. Stellar calibrations may be referenced to estimate the sky conditions. Infrared mission data is then processed for radiant intensity, and photometric signatures are processed to obtain normalized visual magnitude (MV). Finally, a report is produced that includes the following:

- element sets and state vector data
- pass geometry
- calibration data and results
- visible and IR photometric plots
- visible and IR imagery
- environmental data (wind speed and direction, temperature, pressure, dewpoint)

In addition to data packages, the capability for extensive fusion of data of various kinds and interpretation for Space Object Identification (SOI) and Mission Payload Assessment (MPA) may be required. Specialized data reports using advanced data analysis may be produced upon request.

## Calibration and Validation

Table 6-1 and Table 6-2 outline the available AMOS/MOTIF sensors, the calibration techniques used in pre- or post-mission data collection, and the recording formats used in data collection for each sensor. The evaluation and validation criteria used in analysis of raw data is listed. The data is processed or edited prior to dissemination to MSSS Users.

**Table 6-1, Sensor Validation Criteria**

<b>Sensor</b>	<b>Validation Criteria</b>
GEMINI	Nominal sky background measurements, valid Point Spread Function (PSF) star radii, track stability, how well object is resolved, and appropriate computed Fried coherence parameter ( $R_0$ ) values
GEMINI IR	Intensity of the recorded image of the object, brightness, how well object is resolved, track stability
LLLTV	Intensity of image of object, how well object is resolved, track stability
MAIS	Intensity of image of object, how well object is resolved, glints, track stability
AMTA/CMP	Valid instrument calibration-detector responsivity, valid stellar calibration with respect to the atmosphere, SNR, track stability
ARS	Valid stellar calibration and atmospheric extinction values, SNR, track stability
AATS, MATS, BATS, LATS	Relative brightness of images, stability of track

Required data packages and reports are prepared and prompt delivery to the user is ensured.

**Table 6-2, Sensor Calibration and Data Format**

<b>Sensor</b>	<b>Calibration</b>	<b>Raw Data Format</b>
GEMINI	Photometric and double stars	Digital data in Gemini format
GEMINI IR	IR stars, black body	Digital data in Gemini format
MAIS	Photometric and double stars	U-matic and DVCPRO video tape
LLLTV	Photometric and double stars	U-matic and DVCPRO video tape
AMTA	IR stars, black body	Strip chart, Digital data
CMP	Photometric stars	Digital data
ARS	Photometric, IR, and double stars	Digital data

**Table 6-3, Processed Data Formats**

<b>Sensor</b>	<b>Processed Data Format</b>
GEMINI	Digital imagery data in GEMINI and TIFF format
GEMINI IR	Digital imagery data in GEMINI and TIFF format
MAIS	U-matic, VHS and DVCPro video tape
LLLTV	U-matic, VHS and DVCPro video tape
AMTA	Strip chart, Calibrated digital data
CMP	Normalized digital data
AATS, MATS, BATS, LATS	U-matic, VHS and DVCPro video tape
RMET	MSExcels tables and plots on floppy disk
LWIR	
ARS	Digital data

## **Data Communication and Distribution**

Data communication systems are described in paragraph 5.4.1 in the previous section.

The MOTIF Integrated Application System (MIDAS), provides capability for collecting, recording, displaying, editing and processing photometric, radiometric, positional and range data, and dispatching data to be transmitted by AUTODIN.

The system is capable of simultaneous, real-time acquisition and storage of metric, CMP, and AMTA data. Concurrent with its data acquisition function, data from a completed track may be called up for processing. The data is displayed graphically in high resolution (4096 X 4096) in both its raw and processed form.

The system provides the operator with:

- manual editing
- smoothing and integration
- processing of both stellar and black body data for determination of responsivity and extinction parameters
- database management functions to maintain current, mean, and nominal values of calibration parameters
- background subtraction
- reduction of data to desired physical parameters
- generation of hard copy reports and plots
- formatting and transmission over AUTODIN to HQ AFSPC.

## **MOTIF Integrated Data Application System (MIDAS) Software**

The MIDAS software runs on a Silicon Graphics SGI 4D210GTX and encompasses:

- external communications
- reception of Space Command mean element sets
- reception of Space Command tasking messages
- transmission of AMOS/MOTIF metric data in accordance with the Space Command B-3 format
- transmission of AMOS/MOTIF CMP and AMTA signature data in accordance with the Space Command SIGTRANS format
- mission planning (see paragraphs on mission planning software for details)
- data collection and processing of photometric, radiometric, and positional (metric)
- recording
- displaying
- editing
- applications library for
- inter-computer communication
- algorithms
- conversions

## **Image Data Production System (IDPS) Software**

IDPS software is an end-to-end data product system driven by both site and customer requirements. IDPS runs in two modes production or analysis. The production mode requires a video frame grabber and is currently supported at MSSS on the following Silicon Graphics workstations : Power Series, Personal Iris (4D/310 VGX or 4D/440 VGX) (1280 X 1024 resolution) or Indigo (1024 X 768 resolution) and IRIX 4.0.1+ Operating System. The analysis mode does not require any frame grabbing hardware, and therefore can run on a wider group of Silicon Graphics platforms. Currently IDPS supports any Silicon Graphic Workstation which will support GL and is running IRIX 5.3 or 6.2.

The IDPS at MSSS:

- digitizes image data from video-based sensors
- reads in digital GEMINI TIFF image files
- accesses MIDAS for state vector information
- overlays information on the image
- orientation vectors
- metrics
- satellite models
- packages images in standard TIFF-PL format